INTRODUCTION

Each year the British Group of IABSE (International Association for Bridge and Structural Engineering) organises the Henderson Colloquium, held in Cambridge in July. About 25 participants are invited and each presents a paper for about 15 minutes. Over a period of two days a mix of presentations, discussions and debates is structured to further the common understanding of the subject. The success of the Henderson Colloquium depends on the mix of the people participating, who can relate relevant case histories within their own experience or who can offer a useful perspective on the topic - both UK-based and from overseas.

The proceedings of the Colloquium are published and copies sent to the libraries of the Institution of Structural Engineers and Institution of Civil Engineers, amongst others, and to other interested parties. Starting with the 2004 Colloquium the proceedings will be made available on the internet as well as in printed form. In many previous years the deliberations of the Henderson Colloquium have been presented at a special evening meeting held at one of the professional engineering institutions in London.

In 2004 the topic for the Henderson Colloquium was **'Designing for the consequences of hazards'**.

The proceedings of the Colloquium are presented in this volume, as follows:

- the introduction to the topic presented to the participants in advance of the Colloquium;
- a short summary of the main conclusions of the Colloquium;
- a more detailed overview of the Colloquium proceedings; and
- the papers presented by the participants.

The Topic

The following briefing was circulated to participants before the Colloquium:

"Over the past 35 years the proportion of a structural designer's time which is spent considering accidental actions has increased significantly. During this period some clients have been applying risk and reliability analyses to their operations and their studies have shown that the costs which result from the loss of function of their structures due to all accidental causes justify spending more on the initial construction. This awareness has resulted in enhanced design requirements for accidents which is why more time is being spent by designers on these topics.

This Colloquium is an opportunity for clients, specifiers, designers and others, to take stock of how well current practice is working.

- Are we getting better structures, which are less susceptible to accidents?
- Could we get better performance for the current level of design and construction cost?
- Could we get equivalent performance for less cost?
- Should we aim for much better performance with a greater design input and/or an increased construction cost?
- Have we got the right balance between preventing accidents, and accommodating them?

- Accidents are, by their nature, indefinable. What is the best way to achieve a robust response to an unknowable event?

- Are there good practices in some fields of application which could be copied in others?

- As modelling methods improve, are there now opportunities to achieve better outcomes which did not exist before?

While we want to discuss the topic in its general context, the topic of Risk and Liability was discussed in the Henderson Colloquium of 2002. Our Colloquium is intended to be more focused on specifically structural aspects of how design requirements are defined, in order to achieve the best outcome."

Summary of Main Conclusions

The Colloquium participants covered the breadth of structural engineering. Each presented a paper related to the topic and in discussions over two days similarities and differences were identified and discussed.

The headline conclusions of the Colloquium can be summarised as:

- Strategies for addressing hazards now have to be central to the design of all facilities and the structures that support them.

- Some hazards are more foreseeable than others. Where sufficient historic data is available, benefits are being achieved by using probabilistic methods to address dominant hazards in a rational way. Strictly, a hazard is not foreseeable, and so the concept of structural robustness is used to cater for the unknown. Robustness is crucial and the ways to achieve it were discussed at length and are reported in the Overview of the Proceedings. There was no support for the traditional tie force approach in the UK Building Regulations, but the Regulations are already moving forward.

- Where there is insufficient data the maximum use should be made of the judgement of experienced practitioners who are likely to be aware of the breadth of issues involved, the range of strategies possible, and the appropriateness of strategies to their context. The most effective role for a client or regulator is to state the high-level objectives, and to monitor, through audit trails, the designer's proposals for meeting the objectives.

- Often the data is only meagre. A plea was made for the use Bayesian statistical methods, which allow subjective judgements to be incorporated into formal, rational procedures. This plea seemed to encapsulate the aspirations of the Colloquium.

Organising Committee

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Participants in the Colloquium and their guests enjoying refreshments by the River Cam, in the grounds of Magdalene College.